

III. REMARKS

Claims 1-24 and 26 are pending in this application. Claim 25 was previously withdrawn. By this amendment, each of claims 1, 9, 10, 19, 24, and 26 has been amended. Reconsideration in view of the above amendments and the following remarks is respectfully requested.

Applicant does not acquiesce in the correctness of the rejections or objections and reserves the right to present specific arguments regarding any rejected or objected-to claims not specifically addressed. Further, Applicant reserves the right to pursue the full scope of the subject matter of the claims in a subsequent patent application that claims priority to the instant application.

In the Office Action, claims 1, 3-5, 8-17, 19, and 21-23 are rejected under 35 U.S.C. 103(a) as allegedly being unpatentable over U.S. Patent No. 6,059,526 to Mayr in view of U.S. Patent No. 6,220,602 to Webster et al. Specifically, the Office alleges, *inter alia*, that Mayer teaches “[a] free portion of the seal (31) contacts a distal end (shown in figure 1b) in the operative state, and is out of contact in an inoperative state (see figure 1a).” Office Action at 2 (emphasis added).

Applicant asserts, however, that the Office has misinterpreted the Mayr reference. First, Applicant asserts that in FIG. 1a of Mayr, which the Office alleges illustrates the Mayr device in an inoperative state, the free portion of the seal appears to be in contact with both distal ends of sheet metal housing 33. Thus, Mayr fails to teach “the free portion [of the seal]...is out of contact with the distal end [of the support portion] in an inoperative state,” as recited in claims 1 and 19.

Second, Applicant asserts that FIG. 1b of Mayr, which the Office alleges illustrates the Mayr device in an operative state, differs from FIG. 1a only in the points of contact between bristles 30 and sheet metal housing 33. Specifically, bristles 30 are shown out of contact with a distal end of sheet metal housing 33 residing below bristles 30 and in contact with crimp bead 34. Neither of these changes in contact teach the limitations of the rejected claims. In fact, they teach the opposite. That is, Mayr teaches bristles out of contact with a distal end of a support device in an operative state while the rejected claims recite a free end of a leaf seal in contact with a distal end of a support portion in an operative state. In addition, crimp bead 34, the portion of sheet metal housing 33 contacted by bristles 30 in FIG. 1b but not 1a, is not “a distal end of the support portion,” as claimed.

Nevertheless, in order to further clarify the differences between the rejected claims and Mayr, and to facilitate early allowance of the pending claims, each of claims 1, 9, and 19 has been amended to make clear that the support is coupled to a low pressure side of the leaf seal. In addition, the operative and inoperative states have been more clearly described as pressurized and unpressurized, respectively.

The Office concedes that Mayer discloses a brush seal, rather than the claimed leaf seal. The Office alleges, however, that “Webster teaches a seal arrangement wherein either a brush seal or leaf seal may be used (column 7, lines 44, 45), thereby establishing the seals as equivalent.” Office Action at 2.

Applicant maintains the assertion in Applicant’s 21 December 2005 Amendment that the teachings of Webster et al. are inapplicable to the present invention. For example, the portion of Webster et al. cited by the Office, which describes the Webster

et al. device in its inoperative state, continues: "...comprising a pair of radially extending supporting plates 124 and 126 and a plurality of bristles, or leaves, 128 arranged between the supporting plates 124 and 126. The bristles, or leaves, 128 are arranged to extend circumferentially and radially and such that the radially inner ends of the bristles, or leaves, 128 contact the surface of the shaft 32." Column 7, lines 46-51 (emphasis added).

Applicant asserts that the teachings of Webster et al. are inapplicable to the teachings of both Mayr and the present invention. In an operative state of their device, Webster et al. teach a deliberate forcing of the "leaf" seal away from the shaft in order to provide clearance. "In operation the repulsive force between the bristles, or leaves, 128 and the magnet or electrically conducting member 130 pushes the bristles, or leaves, 128 away from the shaft 32 to form a clearance to reduce wear of the bristles, or leaves, 128 and the shaft 32." Webster et al. at column 7, lines 60-64 (emphasis added).

Contrarily, Mayr teaches a deliberate maintenance of contact between a brush seal and a rotor. "[T]he bristles of the brush seal comprise angled bristle sections of which the ends run against the seal surface of the rotor." Mayr, column 1, lines 20-22. "The free ends of the bristles identified by 30 of the brush seal run against a circumferential surface U of the rotor 10." *Id.*, column 2, lines 9-11.

Thus, Webster et al. teach away from Mayr. In fact, applicant asserts that if one were to combine Webster et al.'s teaching of a radially-oriented "leaf " seal with Mayr's teaching of a brush seal in contact with a rotating shaft without provision for seal element resilience, the result would be frictional heating and instant deformation failure similar to that which occurs with fixed labyrinth seal teeth and possible attack of the seal

surface. See *infra* 14-15. “If the proposed modification or combination of the prior art would change the principle of operation of the prior art invention being modified, then the teachings of the references are not sufficient to render the claims *prima facie* obvious.” MPEP 2143.01, citing *In re Ratti*, 270 F.2d 810, 123 USPQ 349 (CCPA 1959). “The test for obviousness is what the combined teachings of the references would have suggested to one of ordinary skill in the art, and all teachings in the prior art must be considered to the extent that they are in analogous arts.” *Id.* (emphasis added).

The teachings of Webster et al. are also inapplicable to the present invention, wherein a clearance is reduced in an operative state, as compared to an inoperative state. See, e.g., FIGS. 21A-C of the application.

The Office states that “[i]t would have been obvious to one having ordinary skill in the art at the time of the invention to use either a brush seal or a leaf seal, as Webster teaches these seals to be equivalent and interchangeable.” Office Action at 2. However, the “leaf” seal of Webster et al. is typical of known leaf seals and clearly distinct from the leaf seal of the present invention, as evidenced by the difference in function of the Webster et al. seal, described above. Applicant further submits that this difference in function is attributable to a difference in structure between known leaf seals and the leaf seal of the present invention. No known leaf seal cited by the Office or known to Applicant includes a free portion angled relative to both a longitudinal axis and a radial plane (i.e., all radial axes) in which seal differential pressure is applied to the face of the leaf. Previously known leaf seal members are oriented substantially parallel to a longitudinal axis and angled from a radial axis in the direction of rotation. Leaves having such an arrangement are essentially axially-extended, flat, bristles of a brush

seal. Retained between radial support plates, operating pressure is applied to edges of exposed upstream leaf seal members.

The leaf seal of the present invention, however, includes a free portion angled relative to both a longitudinal axis and all radial axes of a component to be sealed against and a support coupled to a low pressure side of the leaf seal for supporting the free portion. Leaves of the present invention are oriented 90 degrees from previously known leaf seals and bear differential seal pressure across the exposed leaf face in contrast to edges of previously known leaf seals. The present leaf orientation facilitates placement of a support member on the low pressure side of angled seal member free portions to bear the applied differential seal pressure. Applicant respectfully asserts that the Office has failed to recognize the significance of a leaf seal free portion angled relative to both a longitudinal axis and a radial plane in which seal differential pressure is applied to the face of the leaf.

In addition, Applicant submits that the Office is improperly expanding a very narrow statement by Webster et al. to argue something that does not make sense. Applicant submits that any suggestion of equivalence must be interpreted in view of the rest of the prior art and, more importantly, the specific setting and function in which the suggestion is made. In Webster et al., the alleged suggestion is made in a setting in which no structural conflicts would result from the substitution. In stark contrast, application of a leaf seal in Mayr is totally lacking in provision of seal element bristle resilience. In the Mayr device, bristles sections 31 are extended radially from shaft sections 32 to provide "necessary bristle length to maintain the stiffness of the bristles within acceptable limits. Bristles that are too short and thus too stiff would attack the

seal surface against which the ends run.” Mayr, column 1, lines 11-14. Application of a leaf seal element in Mayr would not provide such resilience and result in their destruction and attack of the seal surface that Mayr seeks to avoid. Applicant submits, therefore, that no one with ordinary skill in the art would ever attempt what the Office alleges the prior art suggests because of the above-described problem.

Nevertheless, each of claims 1, 9, 19, 24, and 26 has been amended to more clearly describe the leaf seal of the present invention and distinguish it from the circumferential and radial orientation of Webster et al.’s “leaf” seal.

With respect to claims 3-5, 14, 21, and 22, the Office alleges that “Mayr discloses the support to include a curved surface (on 33) extending from a proximate end of the support to a distal end. The free portion extends tangentially from the curved surface in the inoperative state.” Office Action at 3. Applicant assumes that the Office is referring to crimp bead 34 of sheet metal housing 33, which appears to include a curved surface in FIGS. 1a and 1b. However, crimp bead 34 clearly does not include a curved surface “extending from the proximate end of the support portion to the distal end,” as recited in claim 3. In fact, the curved surface of crimp bead 34 appears to begin and end over a relatively short distance toward the middle of sheet metal housing 33.

The Office further alleges that Mayr teaches “[t]he free portion (31) is closer to the component to be sealed against (76) in the operative state.” Office Action at 3. First, Applicant notes that there is no element “76” in any of the Mayr figures. Appropriate clarification of the Office’s interpretation of Mayr is respectfully requested. Second, Applicant asserts that nowhere in the Mayr reference is it stated or implied that bristle sections 31 are closer to rotor 10 in an operative state. In fact, FIG. 1b of Mayr,

which the Office alleges shows the Mayr device in an operative state, shows bristles deflected upward, i.e., away from the component to be sealed against. Applicant asserts, therefore, that the Office's allegation is entirely without support.

With respect to claims 11-13, the Office alleges that "Mayr discloses a distal end of the support portion is thinner (at the beaded portion contacting 31) than a proximate end of the support portion (at 33, shown in figure 1b)." Office Action at 3. Again, Applicant asserts that the Office's allegation is entirely without support. Nowhere in the Mayr reference is the thickness of sheet metal housing 33 even mentioned, let alone described as having differing thicknesses along its length. The only aspect of the thickness of sheet metal housing 33 that can be inferred from the entire reference is from its figures, and these, Applicant asserts, demonstrate a uniform thickness along its length.

The Office goes on to allege that "Mayr also shows a curved surface extending from the proximate end to the distal end, and the support is coupled to a mount portion (36) that mounts the support to a stationary component." Office Action at 3. As noted above, Applicant asserts that any curved surface of sheet metal housing 33, i.e., crimp bead 34, does not extend from a proximate end to a distal end. Rather, crimp bead 34 is formed and terminates along a relatively short length of sheet metal housing 33 toward its middle.

With respect to claim 15, the Office alleges that "Mayr discloses a holder (36) that mounts the seal assembly to a stationary component and includes a projection (top of 36, figure 1) that protects the free portion." Office Action at 3. Applicant asserts, however, that it is absolutely impossible that any portion of mounting ring 36 will function

to protect a free portion of bristles 30. One need only look at the arrangement of bristles 30, sheet metal housing 33, and mounting ring 36 to reach this conclusion. The bristles are contained within housing 33 and mounting ring 36 does not extend to the free portion of bristles.

For each of the reasons above, Applicant asserts that none of the rejected claims is obvious in view of Mayr or Webster et al., whether considered individually or in combination, and respectfully requests withdrawal of the rejection.

In the Office Action, claims 2, 18, 20, and 26 are rejected under 35 U.S.C. 103(a) as allegedly being unpatentable over Mayr in view of Webster et al. in further view of U.S. Patent no. 4,813,608 to Holowach et al. Specifically, the Office alleges that “[i]t would have been obvious...to modify Mayr and Webster as taught by Halowach [sic], such that the layers are made of materials with different coefficients of thermal expansion, so that the differing rates of expansion causes the seal to bend, forming a tight air seal between the structures.” Office Action at 4.

First, Applicant asserts that each of the arguments made above with respect to Mayr and Webster et al. is equally applicable to the present rejection. Second, Applicants do not claim the use of materials having different coefficients of thermal expansion in order to form “a tight air seal between the structures.” In fact, Applicant’s use of materials having different coefficients of thermal expansion is opposite that of Holowach et al. For example, page 23 of the present application reads, in part (emphasis added):

Each leaf seal member 524 includes a first layer 570 of a first material addressing high pressure P_H side of seal member 524, and a second layer 572 of a second material addressing low pressure P_L side of seal member 524. In one embodiment, first material has a lower coefficient of thermal expansion (CTE_1) than second material (CTE_2)...An increase in bimetallic leaf seal temperature induces a change in shape causing seal members 524 to curl upward, increasing clearance with rotor 516.

Each of the rejected claims recites language directed toward the embodiment described above, i.e., the material addressing the high pressure side of the seal member having a lower coefficient of thermal expansion than the material addressing the high pressure side of the seal member. Thus, the claimed seal would not form “a tight air seal between the structures,” as alleged by the Office.

For each of the reasons given above, Applicant asserts that none of the rejected claims is obvious in view of Mayr, Webster et al., or Holowach et al., whether considered individually or in combination, and respectfully requests withdrawal of the rejection.

In the Office Action, claims 6 and 7 are rejected as allegedly being unpatentable over Mayr in view of Webster et al. in further view of U.S. Patent No. 5,042,823 to Mackay et al. Applicant asserts, however, that each of the arguments made above with respect to Mayr and Webster et al. is equally applicable to the present rejection. Accordingly, Applicant asserts that neither claim 6 nor claim 7 is obvious in view of the cited references and respectfully requests withdrawal of the rejection.

In the Office Action, claim 24 is rejected under 35 U.S.C. 103(a) as allegedly being unpatentable over U.S. Patent No. 6,353,263 to Gail et al. in view of Webster et al. Specifically, the Office alleges that “Gail discloses the angle between portions (6) and (7) to be ‘approximately’ ninety degrees (column 4, lines 6). Because this is an

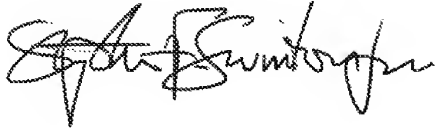
‘approximate’ angle, it includes angles that are not ninety degrees, which would provide a frustoconical shape.” Office Action at 5.

First, Applicant asserts that each of the arguments made above with respect to Webster et al. is equally applicable to the present rejection. Second, Applicant notes that the portion of Gail et al. cited by the Office is incomplete and taken out of context. The full sentence reads: “The angle between the shaft sections 6 and the bristle sections 7 arranged at an angle is approximately 90°, so that the bristle sections 7 arranged at an angle are essentially positioned in one radial plane.” Gail et al., column 4, lines 5-8.

Thus, Gail et al. do not teach the arrangement recited in claim 24, as amended, wherein the free portion is angled relative to both a longitudinal axis and all radial axes of a component to be sealed against. Accordingly, for each of the reasons above, Applicant asserts that claim 24, as amended, is not obvious in view of Webster et al. or Gail et al., whether considered individually or in combination, and respectfully requests withdrawal of the rejection.

Applicant asserts that any dependent claim not specifically addressed above is allowable for the reasons given above as well as its own unique features. In view of the foregoing, Applicant respectfully requests withdrawal of the rejection and objections and allowance of the application. Should the Examiner require anything further from Applicant, the Examiner is invited to contact Applicant’s undersigned representative at the number listed below.

Respectfully Submitted,



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